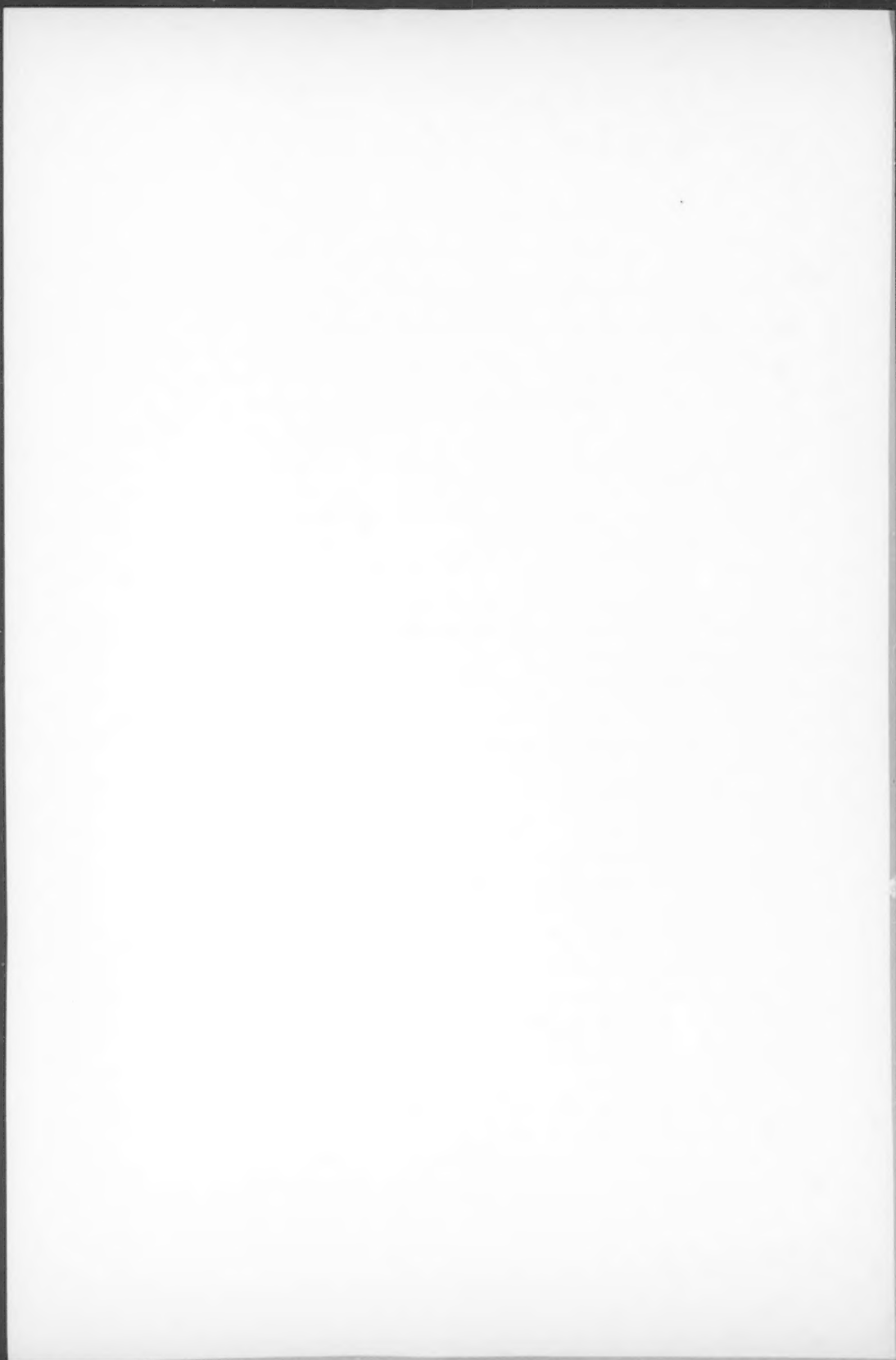


THE ANNALS
of
STATISTICS

AN OFFICIAL JOURNAL OF THE INSTITUTE OF
MATHEMATICAL STATISTICS

VOLUME 6

1978



CONTENTS OF VOLUME 6

SPECIAL INVITED PAPER

STIGLER, STEPHEN M. Mathematical statistics in the early states	239-265
---	---------

ARTICLES AND SHORT COMMUNICATIONS

AALEN, ODD. Nonparametric estimation of partial transition probabilities in multiple decrement models	534-545
AALEN, ODD. Nonparametric inference for a family of counting processes	701-726
ABDEL-HAMEED, M. AND SAMPSON, ALLAN R. Positive dependence of the bivariate and trivariate absolute normal t , χ^2 , and F distributions	1360-1368
ADICHIE, J. N. Rank tests of subhypotheses in the general linear regression	1012-1026
AFSARINEJAD, K. AND HEDAYAT, A. Repeated measurements designs, II	619-628
ALBERS, W. One-sample rank tests under autoregressive dependence	836-845
ALBERS, W. A note on the Edgeworth expansion for the Kendall rank correlation coefficient	923-925
ALBERS, W. Testing the mean of a normal population under dependence	1337-1344
BAKSALARY, J. K. AND KALA, R. A bound for the Euclidean norm of the difference between the least squares and the best linear unbiased estimators	1390-1393
BERAN, RUDOLF. An efficient and robust adaptive estimator of location	292-313
BERGER, JAMES O. AND SRINIVASAN, C. Generalized Bayes estimators in multivariate problems	783-801
BERK, ROBERT H. Asymptotic efficiencies of sequential tests II	813-819
BERK, ROBERT H. AND BROWN, L. D. Sequential Bahadur efficiency	567-581
BHANSALI, R. J. Linear prediction by autoregressive model fitting in the time domain	224-231
BHATTACHARYA, R. N. AND GHOSH, J. K. On the validity of the formal Edgeworth expansion	434-451
BICKEL, P. J. Using residuals robustly I: tests for heteroscedasticity, nonlinearity	266-291
BICKEL, P. J. AND VAN ZWET, W. R. Asymptotic expansions for the power of distributionfree tests in the two-sample problem	937-1004
BOYD, DAVID W. AND STEELE, J. MICHAEL. Lower bounds for nonparametric density estimation rates	932-934
BRANDWEIN, ANN R. COHEN AND STRAWDERMAN, WILLIAM E. Minimax estimation of location parameters for spherically symmetric unimodal distributions under quadratic loss	377-416

BRETH, M. Bayesian confidence bands for a distribution function . . .	649-657
BROOK, RICHARD J. AND MOORE, TERRY. Risk estimate optimality of James-Stein estimators	917-919
BROWN, B. M. AND KILDEA, D. G. Reduced U -statistics and the Hodges-Lehmann estimator	828-835
BROWN, LAWRENCE D. A contribution to Kiefer's theory of conditional confidence procedures	59-71
BROWN, L. D. AND BERK, ROBERT H. Sequential Bahadur efficiency	567-581
CALLAERT, HERMAN AND JANSSEN, PAUL. The Berry-Esseen theorem for U -statistics	417-421
CAMPBELL, GREGORY AND HOLLANDER, MYLES. Rank order estimation with the Dirichlet prior	142-153
CARROLL, RAYMOND J. On almost sure expansions for M -estimates	314-318
CHENG, CHING-SHUI. Optimality of certain asymmetrical experimental designs	1239-1261
CHENG, CHING-SHUI. Optimal designs for the elimination of multi-way heterogeneity	1262-1272
CHUANG, DAVID T. AND KADANE, JOSEPH B. Stable decision problems	1095-1110
CRAIG, CECIL C. Harry C. Carver, 1890-1977	1-4
CRUMP, K. S. AND GUESS, H. A. Maximum likelihood estimation of dose-response functions subject to absolutely monotonic constraints	101-111
CSÖRGÖ, MIKLÓS AND RÉVÉSZ, PÁL. Strong approximations of the quantile process	882-894
DYKSTRA, RICHARD L. AND HEWETT, JOHN E. Positive dependence of the roots of a Wishart matrix	235-238
EATON, MORRIS L. Complete class theorems derived from conditional complete class theorems	820-827
EFRON, BRADLEY. The geometry of exponential families	362-376
EFRON, BRADLEY AND OLSHEN, RICHARD A. How broad is the class of normal scale mixtures?	1159-1164
EISENBERG, BENNETT AND SIMONS, GORDON. On weak admissibility of tests	319-332
FABIAN, VÁCLAV. On asymptotically efficient recursive estimation	854-866
FINDEISEN, PETER. A simple proof of a classical theorem which characterizes the gamma distribution	1165-1167
FLEMING, THOMAS R. Nonparametric estimation for nonhomogeneous Markov processes in the problem of competing risks	1057-1070
FLEMING, THOMAS R. Asymptotic distribution results in competing risks estimation	1071-1079
FOX, RICHARD J. Solutions to empirical Bayes squared error loss estimation problems	846-853
FULLER, WAYNE A. AND RAO, J. N. K. Estimation for a linear regression model with unknown diagonal covariance matrix	1149-1158

GHOSH, J. K. AND BHATTACHARYA, R. N. On the validity of the formal Edgeworth expansion	434-451
GORDON, LOUIS AND OLSHEN, RICHARD A. Asymptotically efficient solutions to the classification problem	515-533
GROSS, ALAN J. AND HOSMER, DAVID W., JR. Approximating tail areas of probability distributions	1352-1359
GUESS, H. A. AND CRUMP, K. S. Maximum likelihood estimation of dose-response functions subject to absolutely monotonic constraints	101-111
HARTIGAN, J. A. Asymptotic distributions for clustering criteria	117-131
HEATH, DAVID AND SUDDERTH, WILLIAM. On finitely additive priors, coherence, and extended admissibility	333-345
HEDAYAT, A. AND AFSARINEJAD, K. Repeated measurements designs, II	619-628
HEDAYAT, A. AND WALLIS, W. D. Hadamard matrices and their applications	1184-1238
HEWETT, JOHN E. AND DYKSTRA, RICHARD L. Positive dependence of the roots of a Wishart matrix	235-238
HOLLANDER, MYLES AND CAMPBELL, GREGORY. Rank order estimation with the Dirichlet prior	142-153
HOSMER, DAVID W., JR., AND GROSS, ALAN J. Approximating tail areas of probability distributions	1352-1359
HUDSON, H. M. A natural identity for exponential families with applications in multiparameter estimation	473-484
HULTQUIST, ROBERT A. AND THOMAS, JAMES D. Interval estimation for the unbalanced case of the one-way random effects model	582-587
ISII, K. AND TAGA, Y. Bound on the classification error for discriminating between multivariate populations with specified means and covariance matrices	132-141
JACROUX, MICHAEL A. On the properties of proper (M , S) optimal block designs	1302-1309
JANSSEN, PAUL AND CALLAERT, HERMAN. The Berry-Esseen theorem for U -statistics	417-421
JOGDEO, KUMAR. On a probability bound of Marshall and Olkin	232-234
JOHN, PETER W. M. A note on a finite population plan	697-699
JOHNSON, B. R. AND TRUAX, D. R. Asymptotic behavior of Bayes procedures for testing simple hypotheses in multiparameter exponential families	346-361
JONES, DOUGLAS H. AND SETHURAMAN, J. Bahadur efficiencies of the Student's t -tests	559-566
KADANE, JOSEPH B. AND CHUANG, DAVID T. Stable decision problems	1095-1110
KAILATH, T., MORF, M. AND VIEIRA, A. Covariance characterization by partial autocorrelation matrices	643-648

KALA, R. AND BAKSALARY, J. K. A bound for the Euclidean norm of the difference between the least squares and the best linear unbiased estimators	1390-1393
KAO, CHUNG-SIUNG. On the time and the excess of linear boundary crossings of sample sums	191-199
KARIYA, TAKEAKI. The general MANOVA problem	200-214
KILDEA, D. G. AND BROWN, B. M. Reduced U -statistics and the Hodges-Lehmann estimator	828-835
KIMELDORF, GEORGE AND SAMPSON, ALLAN R. Monotone dependence	895-903
KLIMKO, LAWRENCE A. AND NELSON, PAUL I. On conditional least squares estimation for stochastic processes	629-642
KLOTZ, JEROME H. Testing a linear constraint for multinomial cell frequencies and disease screening	904-909
KOZIOL, JAMES A. Exact slopes of certain multivariate tests of hypotheses	546-558
LAI, TZE LEUNG. Pitman efficiencies of sequential tests and uniform limit theorems in nonparametric statistics	1027-1047
LANE, DAVID A. AND SUDDERTH, WILLIAM D. Diffuse models for sampling and predictive inference	1318-1336
LII, KEH-SHIN. A global measure of a spline density estimate	1138-1148
LJUNG, LENNART. Strong convergence of a stochastic approximation algorithm	680-696
MACNEILL, IAN B. Properties of sequences of partial sums of polynomial regression residuals with applications to tests for change of regression at unknown times	422-433
MICHEL, R. On the asymptotic efficiency of strongly asymptotically median unbiased estimators	920-922
MOORE, TERRY AND BROOK, RICHARD J. Risk estimate optimality of James-Stein estimators	917-919
MORF, M., VIEIRA, A. AND KAILATH, T. Covariance characterization by partial autocorrelation matrices	643-648
MUIRHEAD, ROBB J. Latent roots and matrix variates: a review of some asymptotic results	5-33
NELSON, PAUL I. AND KLIMKO, LAWRENCE A. On conditional least squares estimation for stochastic processes	629-642
OBENCHAIN, R. L. Good and optimal ridge estimators	1111-1121
OLSHEN, RICHARD A. AND EFRON, BRADLEY. How broad is the class of normal scale mixtures?	1159-1164
OLSHEN, RICHARD A. AND GORDON, LOUIS. Asymptotically efficient solutions to the classification problem	515-533
PAGANO, MARCELLO. On periodic and multiple autoregressions	1310-1317
PÁZMAN, ANDREJ. Computation of the optimum designs under singular information matrices	465-467
PERNG, S.-S. Exponentially bounded stopping times of invariant	

SPRT's in general linear models: finite mgf case	85-91
PERNG, S.-S. Rate of convergence of estimators based on sample mean	1048-1056
PHAM-DINH, TUAN. Estimation of parameters in the ARMA model when the characteristic polynomial of the MA operator has a unit zero	1369-1389
POLLAK, MOSHE. Optimality and almost optimality of mixture stopping rules	910-916
PRENTICE, M. J. On invariant tests of uniformity for directions and orientations	169-176
RAO, J. N. K. AND FULLER, WAYNE A. Estimation for a linear regression model with unknown diagonal covariance matrix	1149-1158
RAO, M. M. Asymptotic distribution of an estimator of the boundary parameter of an unstable process	185-190
REEDS, JAMES A. Jackknifing maximum likelihood estimates	727-739
RÉVÉSZ, PÁL AND CSÖRGÖ, MIKLOS. Strong approximations of the quantile process	882-894
RIEDER, HELMUT. A robust asymptotic testing model	1080-1094
ROBERTSON, TIM AND WEGMAN, EDWARD J. Likelihood ratio tests for order restrictions in exponential families	485-505
ROBINSON, J. An asymptotic expansion for samples from a finite population	1005-1011
ROBINSON, P. M. On consistency in time series analysis	215-223
ROGERS, W. H. AND WAGNER, T. J. A finite sample distribution-free performance bound for local discrimination rules	506-514
RUBIN, DONALD B. Bayesian inference for causal effects: the role of randomization	34-58
RUKHIN, A. L. Universal Bayes estimators	1345-1351
RUYMGAART, F. H. AND VAN ZUIJLEN, M. C. A. Asymptotic normality of multivariate linear rank statistics in the non-i.i.d. case	588-602
SACKS, JEROME AND YLVISAKER, DONALD. Linear estimation for approximately linear models	1122-1137
SAGER, THOMAS W. Estimation of a multivariate mode	802-812
SALEH, A. K. MD. EHSANES AND SEN, PRANAB KUMAR. Nonparametric estimation of location parameter after a preliminary test on regression	154-168
SAMPSON, ALLAN R. AND ABDEL-HAMEED, M. Positive dependence of the bivariate and trivariate absolute normal t , χ^2 , and F distributions	1360-1368
SAMPSON, ALLAN R. AND KIMELDORF, GEORGE. Monotone dependence	895-903
SCHOLZ, FRIEDRICH-WILHELM. Weighted median regression estimates	603-609
SCHWARZ, GIDEON. Estimating the dimension of a model	461-464
SEIDEN, ESTHER AND WU, CHING-JUNG. A geometric construction of generalized Youden designs for v a power of a prime	452-460

SEN, PRANAB KUMAR AND SALEH, A. K. MD. EHSANES. Nonparametric estimation of location parameter after a preliminary test on regression	154-168
SETHURAMAN, J. AND JONES, DOUGLAS H. Bahadur efficiencies of the Student's <i>t</i> -tests	559-566
SHAH, S. M. On α -resolvability and affine α -resolvability of incomplete block designs	468-471
SIEVERS, GERALD L. Estimates of location: a large deviation comparison	610-618
SILVERMAN, BERNARD W. Weak and strong uniform consistency of the kernel estimate of a density and its derivatives	177-184
SIMONS, GORDON AND EISENBERG, BENNETT. On weak admissibility of tests	319-332
SMITH, WALTER L. Harold Hotelling, 1895-1973	1173-1183
SRINIVASAN, C. AND BERGER, JAMES O. Generalized Bayes estimators in multivariate problems	783-801
STEELE, J. MICHAEL AND BOYD, DAVID W. Lower bounds for nonparametric density estimation rates	932-934
STRASSER, H. Admissible representation of asymptotically optimal estimates	867-881
STRAWDERMAN, WILLIAM E. AND BRANDWEIN, ANN R. COHEN. Minimax estimation of location parameters for spherically symmetric unimodal distributions under quadratic loss	377-416
SUDDERTH, WILLIAM AND HEATH, DAVID. On finitely additive priors, coherence, and extended admissibility	333-345
SUDDERTH, WILLIAM D. AND LANE, DAVID A. Diffuse models for sampling and predictive inference	1318-1386
SUSARLA, V. AND VAN RYZIN, J. Empirical Bayes estimation of a distribution (survival) function from right censored observations	740-754
SUSARLA, V. AND VAN RYZIN, J. Large sample theory for a Bayesian nonparametric survival curve estimator based on censored samples	755-768
TAGA, Y. AND ISII, K. Bound on the classification error for discriminating between multivariate populations with specified means and covariance matrices	132-141
THOMAS, JAMES D. AND HULTQUIST, ROBERT A. Interval estimation for the unbalanced case of the one-way random effects model	582-587
THOMPSON, M. E. Stratified sampling with exchangeable prior distributions	1168-1169
TONG, Y. L. An adaptive solution to ranking and selection problems	658-672
TRUAX, D. R. AND JOHNSON, B. R. Asymptotic behavior of Bayes procedures for testing simple hypotheses in multiparameter exponential families	346-361
VAN RYZIN, J. AND SUSARLA, V. Empirical Bayes estimation of a distribution (survival) function from right censored observations	740-754

VAN RYZIN, J. AND SUSARLA, V. Large sample theory for a Bayesian nonparametric survival curve estimator based on censored samples	755-768
VARDEMAN, STEPHEN B. Admissible solutions of finite state sequence compound decision problems	673-679
VIEIRA, A., KAILATH, T. AND MORF, M. Covariance characterization by partial autocorrelation matrices	643-648
WAGNER, T. J. AND ROGERS, W. H. A finite sample distribution-free performance bound for local discrimination rules	506-514
WALLIS, W. D. AND HEDAYAT, A. Hadamard matrices and their applications	1184-1238
WEGMAN, EDWARD J. AND ROBERTSON, TIM. Likelihood ratio tests for order restrictions in exponential families	485-505
WEI, L. J. The adaptive biased coin design for sequential experiments	92-100
WELLS, DANIEL R. A monotone unimodal distribution which is not central convex unimodal	926-931
WOODROOFE, MICHAEL. Large deviations of likelihood ratio statistics with applications to sequential testing	72-84
WU, CHIEN-FU. Some algorithmic aspects of the theory of optimal designs	1286-1301
WU, CHIEN-FU AND WYNN, HENRY P. The convergence of general step-length algorithms for regular optimum design criteria	1273-1285
WU, CHING-JUNG AND SEIDEN, ESTHER. A geometric construction of generalized Youden designs for v a power of a prime	452-460
WYNN, HENRY P. AND WU, CHIEN-FU. The convergence of general step-length algorithms for regular optimum design criteria	1273-1285
YANG, GRACE L. Estimation of a biometric function	112-116
YLVISAKER, DONALD AND SACKS, JEROME. Linear estimation for approximately linear models	1122-1137
ZIDEK, JIM. Deriving unbiased risk estimators of multinormal mean and regression coefficient estimators using zonal polynomials	769-782
VAN ZUIJLEN, M. C. A. AND RUYMGAART, F. H. Asymptotic normality of multivariate linear rank statistics in the non-i. i. d. case	588-602
VAN ZWET, W. R. AND BICKEL, P. J. Asymptotic expansions for the power of distribution-free tests in the two-sample problem	937-1004

NOTES

ALBERS, W., BICKEL, P. J. AND VAN ZWET, W. R. Correction to "Asymptotic expansions for the power of distributionfree tests in the one-sample problem"	1170-1171
BICKEL, P. J., VAN ZWET, W. R. AND ALBERS, W. Correction to "Asymptotic expansions for the power of distributionfree tests in the one-sample problem"	1170-1171
DEVROYE, L. P. AND WAGNER, T. J. Addendum to "The strong uniform consistency of nearest neighbor density estimates"	935

KEIDING, NIELS. Correction to "Maximum likelihood estimation in the birth-and-death process"	472
WAGNER, T. J. AND DEVROYE, L. P. Addendum to "The strong uniform consistency of nearest neighbor density estimates"	935
WELLNER, JON A. Correction to "A Glivenko-Cantelli theorem and strong laws of large numbers for functions of order statistics" ...	1394
VAN ZWET, W. R., ALBERS, W. AND BICKEL, P. J. Correction to "Asymptotic expansions for the power of distributionfree tests in the one-sample problem"	1170-1171

For those of you who need to know what's happening in statistics...

The Institute of Mathematical Statistics
and
The American Statistical Association

announce publication of Volume 3 of

**CURRENT INDEX TO STATISTICS:
APPLICATIONS, METHODS AND
THEORY**

An annual computerized index to the statistical literature

Coverage—Over 5,000 articles in "core" and "related" journals for 1977 are indexed. Author index & index by key words. Example of subject index (complete reference to journal, volume, pages, etc., is given):

Asymptotic Properties of Non-linear Least Squares Estimators • R. I. Jennrich
Interval Estimation of Non-linear Parametric Functions • Halpern, Mantel
Interval Estimation of Non-linear Parametric Functions, II • M. Halpern
On a Problem in Non-linear Prediction Theory • J. B. Robertson
Convergence in Non-linear Regression • T. Tornheim
Non-linear Regression with Minimal Assumptions • H. M. Wagner
Non-linear
Discrimination Among Mechanistic Models • G.E.P. Box
New Analysis of Variance Model for Nonadditive Data • J. Mandel
Simplified Experimental Design • M. J. Box

Important word

Key word

Who should subscribe—All individuals who spend any significant fraction of their time doing statistics. Anyone who spends more than *one hour per year* looking for an article on a particular topic in statistics or redeveloping some technique that already exists in the literature will find it cost effective to have a personal copy of this index.

Editor—Brian L. Joiner, University of Wisconsin. *Assistant Editor*—Jessie M. Gwynne

Management Committee—Donald A. Gardiner, Chairman; Robert M. Elashoff, Seymour Geisser, David Hoaglin, David L. Wallace

Subscription Rates— \$9.00 for members of the two sponsoring societies
\$12.00 for other individuals
\$18.00 for organizational/library subscriptions
(Volumes 1 & 2, covering 1975 and 1976 journals, available at the same rate.)

Send orders and remittance to—

The Institute of Mathematical Statistics
Business Office
3401 Investment Blvd. Suite 6
Hayward, California 94545



